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(54) Electrical connector for card having surface contact point

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equality:

$$a < b < a + c$$

wherein (a) is a thickness of the movable member at the first latch projection and (c) is a maximum amount of deformation of the contact portion of the contact element made by the card pressed.

FIG. 2(A)

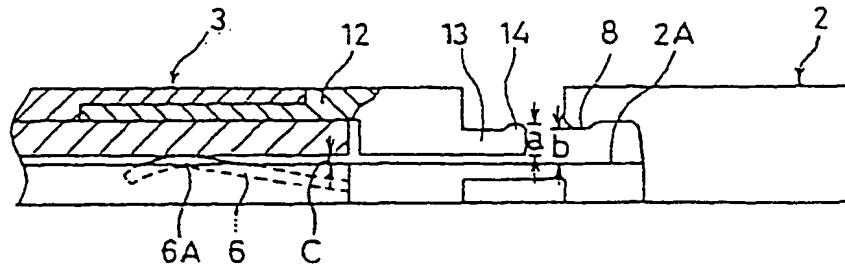


FIG. 2(B)

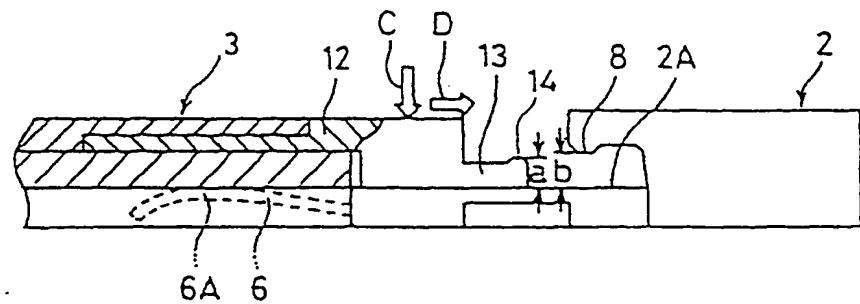
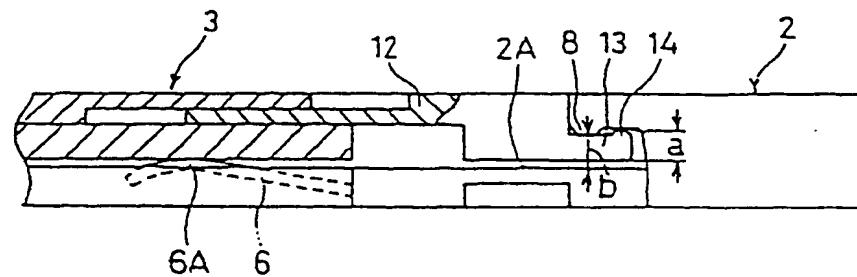


FIG. 2(C)



Description

The present invention relates to an electrical connector for a card having a surface contact point.

To expand or specialize the functions of an electronic device, a card having a surface contact point for a special circuit is inserted into the electronic device.

For example, a subscriber identity module (SIM) card is inserted in a mobile telephone to specialize the telephone for the owner. Consequently, anyone having a SIM card can use the telephone set as his or her personal telephone.

By removing the cover of a mobile telephone set, access can be made to a SIM card socket connector so that it is easy to replace the SIM card. The connector comprises a base made of an insulative material, a plurality of contact elements supported by the base, and a frame rotatably supported by the base. A SIM card is inserted into the frame and the frame is closed onto the base such that the SIM card is brought into contact with the resilient contact elements. The frame is locked to the base. As Japanese patent application Kokai No. 502059/93 shows, the frame is moved along the base by a predetermined distance so that their flexible latch portions snap each other for making lock. Then, the cover is attached and the mobile telephone functions as a dedicated device for the SIM card owner.

However, the above latch portions of the frame and the base receive large forces for elastic deformation so that they wear after a period of use and fail to lock.

Accordingly, it is an object of the invention to provide an electrical connector for a card, which has a long service life without wearing of the latch portions.

The above object is achieved by the invention claimed in claim 1.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an electrical connector according to an embodiment of the invention, wherein the frame is opened;

Fig. 2A is a partially sectional side view of the electrical connector, wherein the movable member is not pressed by the finger;

Fig. 2B is a partially sectional side view of the electrical connector, wherein the movable member is pressed by the finger; and

Fig. 2C is a partially sectional side view of the electrical connector, wherein the movable member is brought into the lock position and the finger pressure is removed.

In Fig. 1, a card connector 1 comprises a base 2 and a frame 3 both made of an insulative material. The

frame is rotatable about an axis 4.

A plurality of parallel slots 5 are provided in the base 2 such that the convex contact portions 6A of contact elements 6 which are made of a resilient metal and supported by the base are projected above a card mounting surface 2A of the base 2. The connection portions 6B of the contact elements 6 are bent downwardly so that when the base is mounted on a circuit board, they are brought into contact with the circuit traces of a circuit board for soldering.

A pair of lock arms 7 extend upwardly and then rearwardly toward the axis 4 from the front end of the base. A latch projection 8 extends downwardly from the end of a lock arm 7 up to a predetermined distance from the upper surface of the base 2.

A pair of cutouts 9 are provided on opposite sides of the base to receive a portion of the frame.

A pair of protruded pieces 10 are provided on opposite sides of the frame 3 to form a receiving slot 11 so that a surface contact card, such as a SIM card, is inserted into the receiving slot from above such that the circuit portion of the SIM card S is opposed to the base 2.

A movable member 12 is attached to the frame 3 so that it is movable in back-and-forward directions A.

A pair of extensions 13 are provided on the movable member 12. A pair of latch projections 14 are provided on the extensions 13 on the side opposite to the base 2.

The positions and sizes of the latch projections 8 and 14 and the contact portions 6A of the contact elements 6 will be described with respect to Figs. 2A-2C, wherein in Fig. 2A, the frame is not pressed by the finger, in Fig. 2B, the frame is pressed by the finger but the latch projections are not engaged, and in Fig. 2C, the frame is latched and the pressure by the finger is released.

In Fig. 2A, the distance (b) between the mounting surface 2A of the base 2 and the latch projection 8 is larger than the thickness (a) of the extension 13 at the position of the latch projection 14. However, the distance (b) is smaller than the sum of the thickness (a) and the amount of projection (c) of the contact portion 6A from the mounting surface 2A.

How to use the connector will be described.

(1) First of all, as shown in Fig. 1, the SIM card S is inserted into the receiving slot 11 of the frame 3 in the direction of an arrow B.

(2) The frame is then rotated downward in Fig. 1 to the closed position as shown in Fig. 2A so that the contact portions 6A of the contact elements 6 support the SIM card S above the mounting surface 2A of the base 2.

(3) The movable member 12 is pressed by the finger in the direction of an arrow C as shown in Fig. 2B so that the card S rests on the mounting surface 2A against the contact portions 6A of the contact ele-

ments 6.

(4) Then, the movable member 12 is moved in the direction of an arrow D as shown in Fig. 2B. Since the distance (b) is larger than the distance (a), the latch projections 14 of the movable member 12 pass the latch projections 8 of the base 2 without any interference with the projections 8.

(5) Then, the finger is removed to release the pressure on the movable member 12 so that the movable member 12 is pushed upwardly by the resilient contact elements 6 via the card S. Consequently, the latch portions 8 and 14 engage each other to lock the frame 3.

(6) To release the lock of the frame 3 and replace the card S, the order of operations (1)-(5) is reversed. That is, the movable member 12 is pressed by the finger to release the lock and moved backwardly (to the left in Fig. 2C) so that the frame 3 is rotated upwardly for replacement of the card S.

The present invention is not limited to the illustrated embodiment. For example, the movable member may be made to form a part of the frame. Moreover, the frame itself may be made movable. In this case, the holes for supporting the rotation shaft are made elongated so that the frame can be moved to the lock position after rotation to the closed position.

In addition, the movable member may be made movable in parallel to the axis of rotation of the frame.

According to the invention, the movable member is pressed and moved forwardly to lock the frame so that the latch portions of the base do not interfere with the latch portions of the frame, preventing wear of the latch portions. When the finger is removed, the latch portions of the frame and the base engage each other to make a firm lock. Thus, the user-friendly lock of a long service life is provided.

Claims

1. An electrical connector for a card having a circuit trace on a surface thereof, comprising:

a base made of an insulative material to provide a card mounting surface;
a resilient contact element having a contact portion projecting from said card mounting surface;
a frame having an end attached to said base for rotation between an open position where said card is received therein and a closed position where said circuit trace is brought into contact with said resilient contact element for electrical connection;

a movable member attached to said frame so as to be movable between a release position and a lock position;
a first latch projection provided on said movable member;
a lock arm extending upwardly from said base beyond said first latch projection at said lock position;
a second latch projection extending downwardly from said lock arm toward said base at a position between first latch projection at said lock position and said end of said base by a distance (b) defined by a following inequality:

$$a < b < a + c$$

wherein (a) is a thickness of said movable member at said first latch projection and (c) is a maximum amount of deformation of said contact portion of said contact element caused by said card pressed.

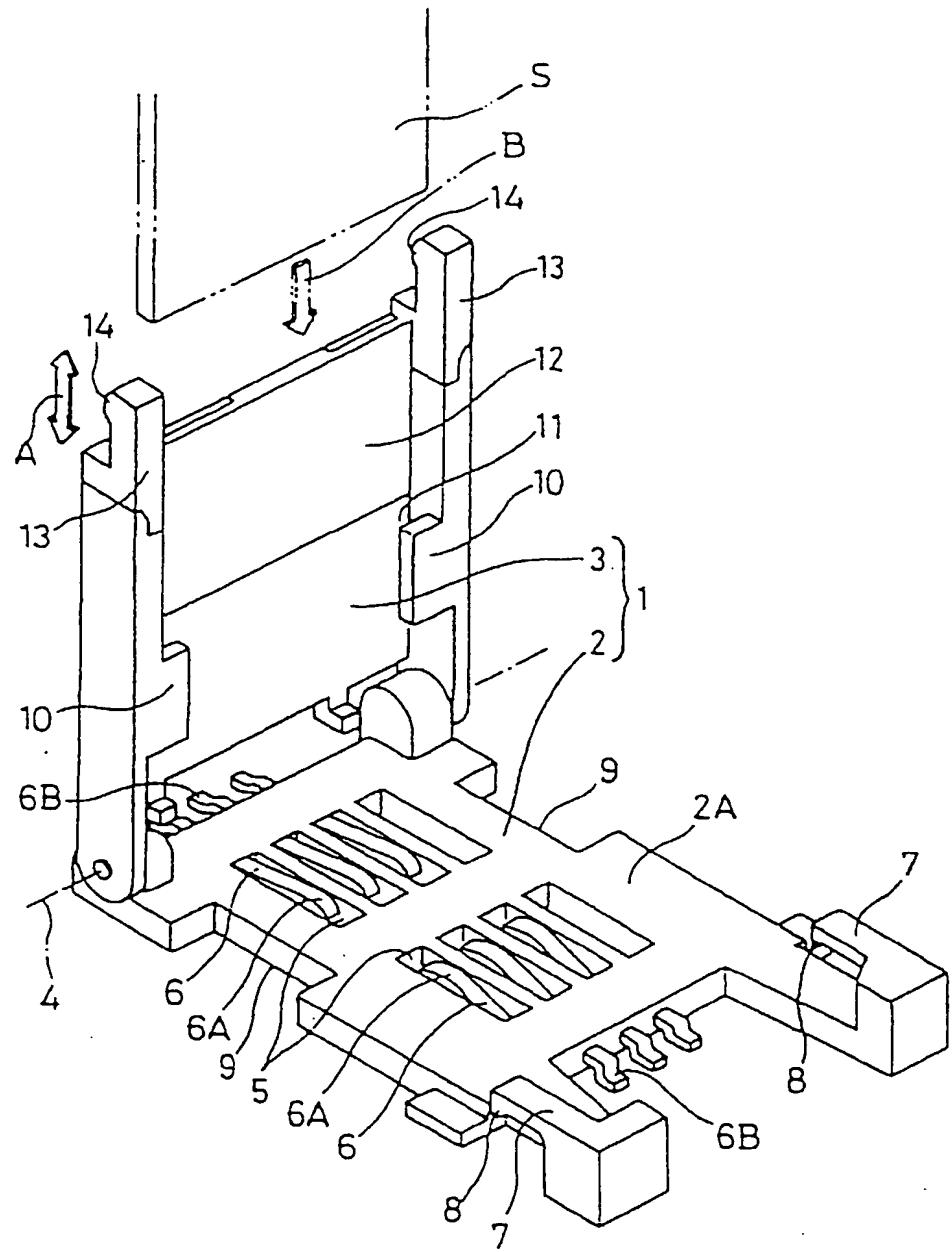


FIG. 1

FIG. 2(A)

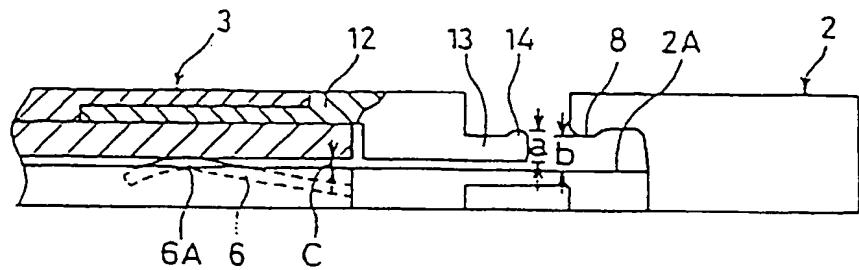


FIG. 2(B)

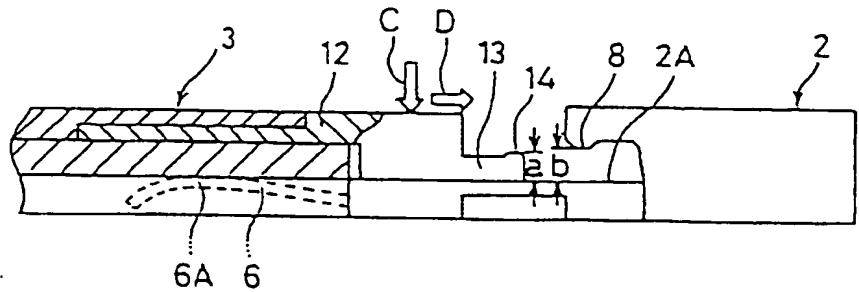
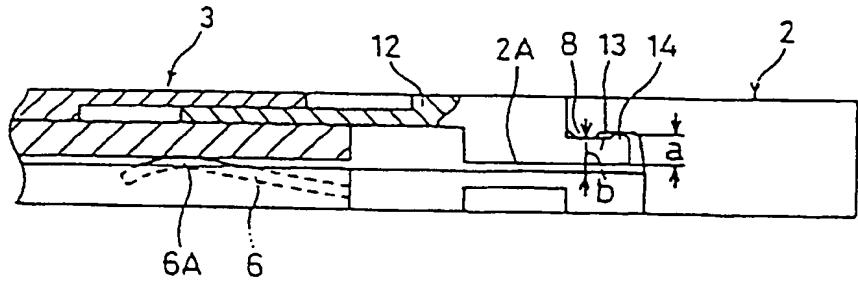
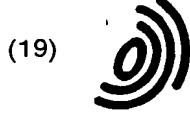


FIG. 2(C)





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European Patent Office
Office européen des brevets



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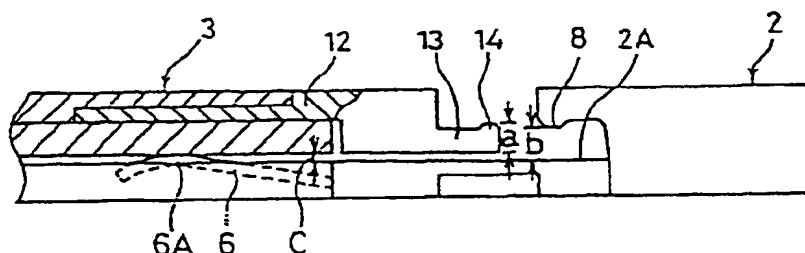
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equality:

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wherein (a) is a thickness of the movable member at the first latch projection and (c) is a maximum amount of deformation of the contact portion of the contact element made by the card pressed.

FIG. 2(A)



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FIG. 2(B)

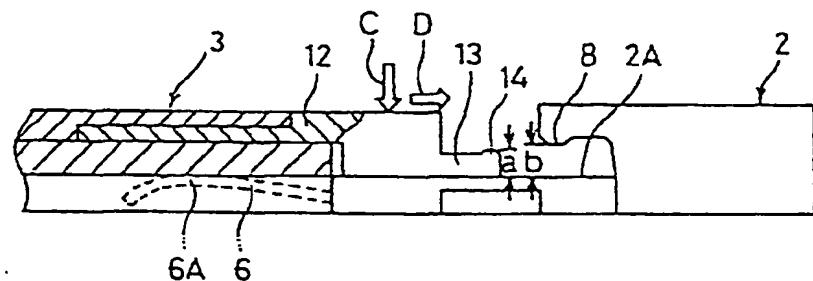
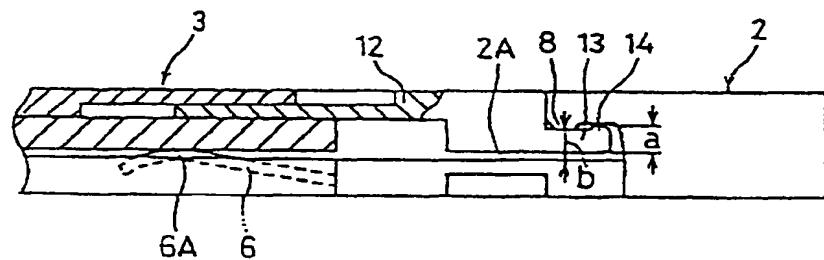


FIG. 2(C)





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 65 0019

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 494 503 A (TECHNOPHONE LTD) 15 July 1992 * column 4, line 3 - column 5, line 13 * * figures 1,4 *	1	H01R23/70 G06K7/00 H01R23/68
A	US 5 603 629 A (PERNET MICHEL ET AL) 18 February 1997 * column 2, line 15 - line 54 * * column 3, line 5 - line 33 * * figures 1-3 *	1	
A	US 5 336 877 A (REICHARDT MANFRED ET AL) 9 August 1994 * column 5, line 12 - line 34 * * figures 9-11 *	1	

The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
BERLIN	29 June 1999	Stirn, J-P	
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ON EUROPEAN PATENT APPLICATION NO.**

EP 98 65 0019

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 The members are as contained in the European Patent Office EDP file on
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29-06-1999

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